

Chapter G1: Background

This report presents the results of an evaluation of two New England coastal facilities, the Seabrook Nuclear Power Station in Seabrook, New Hampshire, and the Pilgrim Nuclear Power Station in Plymouth, Massachusetts. The facilities are located in the same ecological region, but differ in the locations of their CWIS: Seabrook's intakes are located over 1 mile offshore, in relatively deep waters, whereas the Pilgrim intakes are located nearshore in an artificial embayment created by the construction of a series of breakwaters. Section G1-1 of this background chapter provides brief descriptions of the facilities, Section G1-2 describes the environmental setting, and Section G1-3 presents information on the socioeconomic characteristics of the areas near each facility.

CHAPTER CONTENTS

G1-1	Overview of Case Study Facilities	G1-1
G1-2	Environmental Setting	G1-3
	G1-2.1 Gulf of Maine	G1-3
	G1-2.2 Aquatic Habitat and Biota	G1-3
	G1-2.3 Major Environmental Stressors	G1-4
G1-3	Socioeconomic Characteristics	G1-5
	G1-3.1 Major Industries	G1-5
	G1-3.2 Commercial Fisheries	G1-5
	G1-3.3 Recreational Activities	G1-19

G1-1 OVERVIEW OF CASE STUDY FACILITIES

Seabrook facility

The Seabrook facility is a two-unit 1240 MW nuclear power generating station (Normandeau Associates, 1999) located in southeastern New Hampshire just over the state line from Massachusetts and approximately 15 miles south of Portsmouth, New Hampshire (Figure G1-1). Seabrook is situated 3.2 km (2 mi) inland from the Atlantic coast on 364 hectares (889 acres) of land, 202 hectares (500 acres) of which are wetlands.

Commercial operation of the Seabrook station began in 1990. Seabrook had 840 employees in 1999 and generated 8.7 million MWh of electricity.¹ Estimated revenues in 1999 were \$932 million, based on the plant's 1999 estimated electricity sales of 8.2 million MWh and the 1999 company-level electricity revenues of \$113.42 per MWh. Seabrook's 1999 production expenses totaled almost \$182 million, or 2.101 cents per kWh, for an operating income of \$750 million.

Both Seabrook generating units use pressurized-water reactors and are equipped with a circulating water system for condensing steam back to feedwater (Normandeau Associates, 1999). The circulating water system uses 5,000 m (17,000 ft) long pipes to draw ocean water from Ipswich Bay via intakes 2,000 m (7,000 ft) offshore at a depth of 18 m (60 ft). Each intake is equipped with a 9 m (30 ft) diameter velocity cap to regulate the intake flow. The normal flow at the Seabrook facility is 811 MGD with a velocity of 0.5 fps. Once used, water in the cooling system is discharged through diffuser nozzles back into the Atlantic Ocean 1,700 m (5,500 ft) from the plant (New Hampshire Yankee Electric Company, 1986).

❖ Ownership Information

Seabrook is a regulated utility plan operated by North Atlantic Energy Service Corporation, a subsidiary of Northeast Utilities (NU). Seabrook is jointly owned by several utility companies, with NU owning 40 percent, the largest share in the plant (Form EIA-860A, 2000). Through its subsidiaries, NU provides electric power to 1.7 million customers throughout New England. NU is a domestically focused company that had 9,260 employees in 2000 (Hoover's, 2001g). NU owns or controls more than 4,500 megawatts of capacity. During 2000, NU posted revenues of \$5.9 billion and sold 75.6 million MWh of electricity (NU, 2001a,b).

Pilgrim began operation as a regulated utility plant. In July 1999, Entergy Nuclear acquired the plant from Boston Edison. Entergy Nuclear is a division of Entergy Corporation. Entergy Corporation is a global, competitive energy company with 14,100 employees worldwide and a total generating capacity of more than 30,000 megawatts. In 2000, Entergy posted MWh sales of over 103 million and revenues of \$10.0 billion (Hoover's, 2001e; Entergy Corporation, 2001).

¹ One MWh equals 1,000 KWh.

Pilgrim facility

The Pilgrim facility is a 670 MW nuclear power plant on the northwest shore of Cape Cod Bay on Plymouth Bay (Entergy Nuclear General Company, 2000). The facility is about 61 km (38 mi) southeast of Boston and 71 km (44 mi) east of Providence, Rhode Island (Figure G1-1).

Figure G1-1: Locations of the New England Coastal Case Study Facilities



Commercial operation of the Pilgrim station began in 1972. In 1998, Pilgrim generated 5.7 million MWh of electricity. Estimated 1998 revenues for the Pilgrim plant were \$597 million, based on the plant's 1998 estimated electricity sales of 5.3 million MWh and the 1998 company-level electricity revenues of \$112.00 per MWh. Pilgrim's 1998 production expenses totaled \$143 million, or 2.503 cents per kWh, for an operating income of \$454 million.²

² Pilgrim was sold to Entergy Nuclear, a nonutility, in July of 1999. Therefore, the FERC Form-1 data presented in this section are not available for 1999.

Pilgrim uses a boiling water reactor to produce steam and a once-through cooling system that draws its water from Plymouth Bay directly offshore from an embayment created when the facility constructed a series of breakwaters. The cooling system uses two pipes with an intake capacity of 224 MGD. The intake structure consists of wing walls, a skimmer wall, vertical bar racks, and vertical traveling screens to remove aquatic organisms and small debris. The intake approach velocity just before the screens is 1 fps (ENSR, 2000).

Table G1-1 summarizes the plant characteristics of the Seabrook and Pilgrim power plants.

Table G1-1: Summary of Seabrook and Pilgrim Plant Characteristics		
	Seabrook (1999)	Pilgrim (1998)
Plant EIA Code	6115	1590
NERC Region	NPCC	NPCC
Total Capacity (MW)	1,240	670
Primary Fuel	Uranium	Uranium
Number of Employees	840	670 ^a
Net Generation (million MWh)	8.7	5.7
Estimated Revenues (million dollars)	932	597
Total Production Expense (million dollars)	182	143
Production Expense (¢/kWh)	2.101	2.503
Estimated Operating Income (million dollars)	750	454

Notes: NERC = North American Electric Reliability Council
 NPCC = Northeast Power Coordinating Council
 Dollars are in \$2001.
^a 1996 data.

Source: Form EIA-860A (NERC Region, Total Capacity, Primary Fuel); FERC Form-1 (Number of Employees, Total Production Expense); Form EIA-906 (Net Generation).

G1-2 ENVIRONMENTAL SETTING

G1-2.1 Gulf of Maine

The Seabrook and Pilgrim facilities are both on the Gulf of Maine, an area bounded to the south and east by tall underwater landforms called “banks” that form a barrier to the North Atlantic. The western and northern boundaries to the Gulf of Maine are defined by the coastlines of Massachusetts, New Hampshire, Maine, New Brunswick, and Nova Scotia.

The Seabrook facility is located on the Browns River near a salt marsh estuary, about 2 miles inland from the coast. The estuary is formed by the confluence of several waterways, including the Hampton, Browns, and Blackwater rivers and Mill Creek. Approximately 10% of the estuary is open water, and the remainder is salt marsh. Hampton Harbor, which is located at the mouth of the Browns River, is a shallow lagoon, roughly 1.9 km (1.2 mi) wide by 2.4 km (1.5 mi) long, behind the barrier beaches at Hampton and Seabrook (Normandeau Associates, 1994b).

The western shore of Plymouth Bay near the Pilgrim facility is a mix of sand beaches, bluffs, and boulder outcroppings (Kelly et al., 1992). The mouth of the Plymouth Bay estuary is approximately 6.4 km (4 mi) northwest of the Pilgrim facility.

G1-2.2 Aquatic Habitat and Biota

The aquatic community near the Seabrook facility is typical of that found in the northeastern United States waters (Normandeau Associates, 1999). The submerged rock surfaces near Seabrook support rich and diverse communities of attached algae and animals that are a rich food source for more than 30 fish species that use the area as a nursery as well as for rearing and forage. Several fish species found in the coastal waters near Seabrook support commercial and recreational fisheries, such as winter flounder (*Pleuronectes americanus*), yellowtail flounder (*Limanda ferruginea*), Atlantic cod (*Gadus morhua*), Atlantic mackerel (*Scomber scombrus*), and Atlantic herring (*Clupea harengus*). Forage fish such as Atlantic silverside (*Menidia menidia*) are also present in these waters.

The part of Cape Cod Bay where the Pilgrim facility is located is a zoogeographic boundary, marking the distributional limits for many marine organisms (Kelly et al., 1992). Many species typically associated with the seasonally warmer waters south of Cape Cod, e.g., spotted hake (*Urophycis regius*), oyster toadfish (*Opsanus tau*), and rainwater killifish (*Lucania parva*), occasionally move north into Cape Cod Bay in mid- to late summer. However, most northern species, e.g., rainbow smelt (*Osmerus mordax*), Atlantic tomcod (*Microgadus tomcod*), and rock gunnel (*Pholis gunnellus*), rarely extend into the waters south of Cape Cod Bay (Able and Fahay, 1998).

G1-2.3 Major Environmental Stressors

a. Habitat loss and alteration

The areas surrounding the Pilgrim and Seabrook facilities have long been inhabited, and support a wide range of human activities. As a result, there has been significant habitat alteration and loss because of wetlands draining/filling for construction of residential and commercial structures, as well as alterations to subaquatic habitats by fishing and onshore residential and industrial activities (e.g., laying of discharge pipes). One common alteration relates to the restriction of tidal flows to tidal wetlands through diking or the construction of roadways with improperly sized culverts among other causes. In these areas, as the tidal flows have been diminished or eliminated, the formerly salt-tolerant vegetation characteristic of a tidal wetland were colonized by less salt tolerant species, notably *Phragmites australis*, a tall reed grass that is native to New England. *Phragmites* grows in dense monoculture stands that reduce the ability of the habitat to support aquatic and terrestrial species.

b. Introduction of non-native species

There are concerns over the introduction of non-native species into the coastal habitats of Massachusetts through ship ballast water (MIT Sea Grant, 2001). One species that recently colonized southern Massachusetts waters is *Hemigrapsus sanguineus*, a crab native to the western North Pacific. *H. sanguineus* eats a variety of algae and animals, including juvenile clams, and affects the local ecology by competing for food and habitat space with native crab species, although it may also serve as a food source for larger animals (MIT Sea Grant, 2001).

Other invasive species include bittersweet (*Celastrus orbiculatus*) and saltspray rose (*Rosa rugosa*) (Manomet Center for Conservation Sciences, 2001).

c. Overfishing

Based on trends in catch and fishing effort, the National Marine Fisheries Service (NMFS) believes that the dominant factor affecting New England's commercial fish stocks is overfishing (NMFS, 1999b). NMFS statistics show that standardized trawl effort for groundfish in the Gulf of Maine approximately doubled from 1976 to 1988, yet fishermen saw a decline in landings and catch per unit effort during that period (Townsend and Larsen, 1992). The changes in commercial fish stocks brought about by overexploitation also have consequences for the noncommercial and recreational fish species.

d. Pollution

The large population and residential and industrial development near the Pilgrim and Seabrook facilities are a source of nonpoint source (NPS) pollution, which plays a major role in adversely affecting the quality and productivity of the nearby waters. When rainwater and snowmelt run over farm fields, city streets, timberland, and lawns, other pollutants such as soil sediments, fertilizers, sewage, and pesticides are picked up and deposited into surface water. Contaminated rainwater often runs directly into coastal waters such as salt marshes and estuaries, impairing water quality and reducing the productivity of coastal habitats. Because estuaries serve as the breeding grounds for fish and other wildlife, commercial fisheries are ultimately affected by NPS pollution (Massachusetts Office of Coastal Zone Management, 1994).

One of the most costly consequences of coastal NPS pollution is the closing of shellfish beds because of excessive fecal coliform counts. Between 1980 and 1994, shellfish bed closings increased dramatically, many the direct result of NPS pollution from septic systems and from domestic and farm animals (Massachusetts Office of Coastal Zone Management, 1994). Finally, the increase in nutrients entering shallow coastal ecosystems (NBEP, 1998) associated with NPS are seen as the most widespread factor altering the structure and function of aquatic systems by causing increased macroalgal biomass and growth. For example, the Waquoit Bay National Estuarine Research Reserve on Cape Cod has experienced a particular problem with increases in seaweeds, which have decreased the areas covered by eelgrass habitats. Eelgrass serves as a primary source of food, shelter, and spawning habitat for an abundance of marine life, including economically important finfish and shellfish species such as winter flounder, tautog (*Tautoga onitis*), bluefish (*Pomatomus saltator*), quahogs or hard clams (*Mercenaria mercenaria*), bay scallops (*Argopecten irradians*), soft-shelled clams (*Mya arenaria*), and blue crab (*Callinectes sapidus* Rathbun) (NBEP, 1998).

G1-3 SOCIOECONOMIC CHARACTERISTICS

In 2000, Rockingham County, where the Seabrook facility is located, had a population of 277,359, a home ownership rate of 75.6%, and a median household income of \$54,161 (Table G1-2; U.S. Census Bureau, 2001). In 2000, Plymouth County, where the Pilgrim facility is located, had a population of 472,822, a home ownership rate of 75.6%, and a slightly lower median household income than Rockingham County (Table G1-2; U.S. Census Bureau, 2001).

Table G1-2: Socioeconomic Characteristics of Rockingham County, New Hampshire and Plymouth County, Massachusetts. Data from 2000 Except Where Shown.

	Rockingham County	Plymouth County
Population	277,359	472,822
Land area (square miles)	695	661
Persons per square mile	399.1	715.3
Median household money income (1997 model-based estimate)	\$54,161	\$49,165
Persons below poverty (% , 1997 model-based estimate)	5.1%	8.6%
Housing units	113,023	181,524
Home ownership rate	75.6%	75.6%
Households	104,529	168,361
Persons per household	2.63	2.74
Households with persons under 18 years (%)	38.1%	39.1%
High school graduates, persons 25 years and over (1990 data)	137,833	232,060
College graduates, persons 25 years and over (1990 data)	41,547	61,614

Source: U.S. Census Bureau, 2001.

G1-3.1 Major Industries

Tourism is a significant economic factor in the region near the Seabrook facility. The population around Seabrook typically doubles in the summer months (New Hampshire Estuaries Project, 2002). Other economic activities in the area include plastics, shoe, and furniture manufacturing, and metal fabrication. Most companies are small, with the largest employing 1,000 people. Total industrial employment is about 3,000 (New Hampshire Estuaries Project, 2002).

The town of Plymouth, near the Pilgrim facility, has relatively little industrial activity (State of Massachusetts, 2002); only approximately 1% of the land in the town is classified as commercial or industrial. Plymouth, however, is a major tourist destination, with beaches and the nearby attractions of Plymouth Rock and Plymouth Plantation, which mark where the Pilgrims landed in Massachusetts and portray life in their initial colony.

G1-3.2 Commercial Fisheries

Commercial fishing in New Hampshire has generated between \$10.0 and \$14.9 million of revenue per year for the past 10 years (personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002). Tables G1-3 and G1-4 show the pounds harvested in New Hampshire and the revenue generated for commercial fisheries from 1990 to 2000. Atlantic cod was the most important commercial fish species, constituting 33% of the catch and 25% of the revenue. American lobster (*Homarus americanus*) was 14% of the catch by weight, but a greater portion of the revenue at 40%. Other commercially important species were spiny dogfish shark (*Squalus acanthias*), pollock (*Pollachius virens*), Atlantic herring, bluefin tuna (*Thunnus thynnus*), American plaice (*Hippoglossoides platessoides*), white hake (*Urophycis tenuis*), yellowtail flounder, and shrimp.

Commercial fishing in Massachusetts generated between \$206 and \$306 million in revenue per year between 1990 and 2000 (personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002). Tables G1-5 and G1-6 show the pounds harvested in Massachusetts and the revenue generated for commercial fisheries from 1990 to 2000. Sea scallop is the most important commercial species by revenue, constituting 5% of the catch and 25% of the revenue. American lobster was 6% of the catch and 22% of the revenue. Atlantic herring was 17% of the catch but only 1% of the revenue. Atlantic cod was 14% of the catch and 11% of the revenue. Other commercially important species are goosefish (*Lophius americanus*), bluefin tuna, winter flounder, yellowtail flounder, spiny dogfish shark, skates (Rajidae), and ocean quahog clam.

Table G1-3: Commercial Fishing Landings in New Hampshire, 1990-2000 (pounds)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Alewife			9,802	2,676					25,994			38,472
Bass, striped	37									33		70
Bluefish	197,075	127,197	228,048	162,622	275,260	187,006	159,833	62,524	16,691	12,129	23,927	1,452,312
Bonito, Atlantic						25						25
Butterfish	1,207	472	151		4,975	283	285	731	8,269	722	7,335	24,430
Clam, Atlantic surf	9,010								1,088			10,098
Cod, Atlantic	3,774,455	4,649,553	3,608,230	2,961,523	3,014,581	2,764,418	2,789,942	2,003,171	1,490,755	350,017	1,756,330	29,162,975
Crab, Atlantic rock						24	118					142
Crab, green			3,515									3,515
Crab, jonah					4,500			828,403	571,780	207,199	518,093	2,129,975
Crabs	206,616	42,500	254,091	170,828	232,014	120,888	22,395	298,544	187,175	457,728	1,046	1,993,825
Cunner					367	816	576	98	129	58	78	2,122
Cusk	127,928	79,864	158,833	67,401	87,000	102,772	121,230	107,783	72,278	40,863	81,181	1,047,133
Dory, American john					3							3
Eel, American			285	1,384					423			2,092
Eel, conger	502	3	74			65	39	1,555	103			2,341
Finfishes unc bait and animal food ^a	151,625	395,365	77,456			130,492	43		710			755,691
Finfishes unc for food ^a	3,309	1,162	30	5,155	408,738	144,750	234,791	115,236	300,714	110,101	500	1,324,486
Finfishes unc spawn ^a	210	527	60	1,083								1,880
Flatfish	121	55			2,004				37			2,217
Flounder, summer	20	87	14									121
Flounder, window-pane	7,720	11,795	4,070	4,093	1,713	1,760	915	242	387	890	1,656	35,241
Flounder, winter	184,306	161,841	125,714	85,869	80,684	63,729	61,857	30,429	29,878	14,659	32,276	871,242
Flounder, witch	71,162	61,788	57,481	59,653	56,106	40,099	34,230	35,137	37,944	42,109	104,717	600,426
Flounder, yellowtail	180,150	196,817	129,435	91,901	101,815	124,764	139,655	89,144	61,683	95,999	192,552	1,403,915
Goose-fish	265,089	249,677	266,296	299,776	557,014	935,609	996,702	939,124	820,732	1,385,138	1,872,520	8,587,677
Haddock	36,057	40,643	26,031	19,279	19,129	34,245	24,118	29,988	44,132	73,579	134,301	481,502
Hagfishes								8,196				8,196
Hake, Atlantic red/white	343,565	271,280	23,231	8,881	15,068	11,294	30,511	36,629	6,600	13,153	30,545	790,757
Hake, red	298	834	48,985	46,455	67,312	31,909		6		1,429		197,228
Hake, silver	227,073	172,558	185,188	141,909	202,935	194,300	242,859	327,637	108,042	243,807	358,296	2,404,604
Hake, white	1,521	154,323	632,807	288,419	539,539	481,092	305,029	284,588	193,670	630,078	705,446	4,216,512
Halibut, Atlantic	848	1,133	858	453	210	802	924	2,395	1,566	2,523	9,552	21,264
Herring, Atlantic	368,000	381,070	562,413	774,292	435,200	323,894	33,655	152,431	260,463	2,442,736	5,581,880	11,316,034
Lobster, American	1,658,200	1,802,035	1,529,292	1,693,347	1,650,751	1,834,794	1,632,829	1,414,368	1,194,653	1,380,714	1,157,941	16,948,924
Lumpfish						48	1,002	7,476	35			8,561
Mackerel, Atlantic	49,645	13,659	102,264	44,898	47,990	45,812	27,784	10,539	18,985	21,350	7,620	390,546
Mantis shrimps										236		236

Table G1-3: Pounds of Commercial Fishing Landings in New Hampshire, 1990-2000 (pounds) (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Menhaden, Atlantic	264,500	204,000	25,920	3,710					9			498,139
Mussel, blue								115				115
Plaice, American	206,520	180,850	352,115	326,775	321,442	294,089	347,054	246,328	213,684	178,326	185,612	2,852,795
Pollock	1,699,460	1,117,535	1,162,159	1,223,348	1,001,842	842,534	818,130	1,290,123	1,412,644	1,640,980	1,337,440	13,546,195
Pout, ocean	5,396	5,577	12,228	5,130	2,016	1,830	3,162	2,525	1,061	89	278	39,292
Redfish or ocean perch	31,784	42,491	11,953	16,228	18,609	19,287	14,774	10,755	16,988	44,897	47,992	275,758
Sandworms								599				599
Scallop sea					442	256	256	1,065	6,887			8,906
Scups or porgies				67								67
Sea raven						8,884		6,997		227	65	16,173
Sea urchins	59,800	47,797	102,494	46,163	12,117	4,074	10,410	18,337		5,041	792	307,025
Shad, American	38,206	18,924	9,903	6,549	28,226	30,561	35,561	25,436	15,169	3,674	5,942	218,151
Shark, porbeagle	640	125	397						7,804	4,024	3,137	16,127
Shark, spiny dogfish	185,175		402,184	1,641,614	2,597,792	2,106,255	1,079,523	1,009,140	1,893,425	1,242,893	2,334,497	14,492,498
Sharks	2,173	8,868	5,566	6,928	11,988	11,602	10,463	6,720	869	1,413	97	66,687
Sheepshead											63	63
Shellfish										69,831	82,635	152,466
Shrimp, marine other	986,194	459,141	220,733	972,705	1,148,571	1,658,588	1,692,017	1,256,950	887,059	375,861	467,956	10,125,775
Silver-sides				8,888								8,888
Skates	23,140	27,371	22,223	20,837	81,877	54,486	44,688	37,345	42,163	57,997	84,709	496,836
Smelt, rainbow			36				346					382
Snails (conchs)						4,544	5,867	19,620	13,449	2,504	274	46,258
Squid, longfin							12					12
Squid, northern shortfin	128	208	446		20	3	205	861	6,075	4,518	641	13,105
Squids	810	6,838	4,555	5,402	4,363	896	3,202	1,626	234			27,926
Sturgeons	140											140
Tautog	5	63	4									72
Tilefish			172	36	50					26		284
Tuna, bluefin	62,194	267,853	182,554	128,603	138,323	104,648	106,505	143,024	170,290	79,480	8,171	1,391,645
Tuna, yellowfin						462						462
Wolfish, Atlantic	25,409	17,852	22,965	19,117	27,980	40,005	34,749	31,772	29,703	18,606	21,674	289,832
Total	11,457,423	11,221,731	10,573,261	11,363,997	13,200,566	12,758,694	11,068,246	10,895,712	10,172,429	11,257,637	17,159,767	131,129,463

^a Note: "All annual and monthly landing summaries will return only nonconfidential landing statistics. Federal statutes prohibit public disclosure of landings (or other information) that would allow identification of the data contributors and possibly put them at a competitive disadvantage. Most summarized landings are nonconfidential, but whenever confidential landings occur they have been combined with other landings and usually reported as "finfishes, unc" (unclassified) or "shellfishes, unc." Total landings by state include confidential data and will be accurate, but landings reported by individual species may, in some instances, be misleading due to data confidentiality (Personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002)."

Table G1-4: Revenue from Commercial Landings in New Hampshire, 1990-2000

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Alewife			\$4,900	\$576					\$3,795			\$9,271
Bass, striped	\$65									\$81		\$146
Bluefish	\$52,048	\$33,799	\$61,352	\$62,866	\$76,030	\$57,231	\$44,134	\$16,529	\$5,794	\$5,302	\$9,493	\$424,578
Bonito, Atlantic						\$15						\$15
Butterfish	\$559	\$283	\$117		\$998	\$89	\$84	\$479	\$7,434	\$474	\$4,095	\$14,612
Clam, Atlantic surf	\$4,240								\$3,264			\$7,504
Cod, Atlantic	\$2,487,035	\$3,714,543	\$3,169,995	\$2,673,803	\$2,708,000	\$2,469,878	\$2,143,393	\$1,635,941	\$1,549,945	\$394,173	\$1,807,127	\$24,753,833
Crab, Atlantic rock						\$13	\$60					\$73
Crab, green			\$1,177									\$1,177
Crab, jonah					\$1,800			\$386,204	\$282,042	\$121,184	\$310,854	\$1,102,084
Crabs	\$76,721	\$13,600	\$93,075	\$63,938	\$92,297	\$47,209	\$12,003	\$166,294	\$96,485	\$249,232	\$621	\$911,475
Cunner					\$253	\$368	\$211	\$61	\$51	\$12	\$11	\$967
Cusk	\$60,516	\$41,960	\$79,086	\$34,970	\$48,458	\$58,651	\$67,616	\$55,859	\$41,031	\$28,480	\$44,975	\$561,602
Dory, American john					\$3							\$3
Eel, American			\$430	\$2,076					\$486			\$2,992
Eel, conger	\$50	\$1	\$23			\$12	\$6	\$175	\$2			\$269
Finfishes unc bait and animal food ^a	\$12,130	\$31,665	\$7,571			\$12,333	\$43		\$42			\$63,784
Finfishes unc for food ^a	\$2,498	\$835	\$22	\$642	\$36,271	\$14,414	\$22,813	\$11,506	\$35,866	\$10,505	\$48	\$135,420
Finfishes unc spawn ^a	\$21	\$265	\$36	\$958								\$1,280
Flatfish	\$97	\$14			\$2,443				\$37			\$2,591
Flounder, summer	\$16	\$92	\$12									\$120
Flounder, windowpane	\$1,682	\$2,811	\$1,548	\$1,851	\$802	\$566	\$385	\$126	\$213	\$643	\$1,186	\$11,813
Flounder, winter	\$162,050	\$171,968	\$134,087	\$88,709	\$87,114	\$69,353	\$67,904	\$38,368	\$32,873	\$15,948	\$31,077	\$899,451
Flounder, witch	\$133,673	\$103,683	\$81,856	\$92,267	\$92,459	\$70,496	\$59,889	\$71,419	\$64,026	\$59,375	\$123,949	\$953,092
Flounder, yellowtail	\$141,619	\$182,027	\$120,017	\$94,436	\$116,499	\$137,533	\$129,947	\$110,828	\$70,931	\$92,821	\$194,863	\$1,391,521
Goosefish	\$138,990	\$172,399	\$139,246	\$167,584	\$390,528	\$741,098	\$806,147	\$801,504	\$670,769	\$1,714,930	\$2,714,813	\$8,458,008
Haddock	\$46,939	\$56,015	\$34,859	\$32,039	\$29,983	\$50,185	\$30,081	\$37,153	\$59,408	\$103,640	\$186,665	\$666,967
Hagfishes								\$2,131				\$2,131
Hake, Atlantic red/white	\$126,680	\$95,079	\$6,469	\$1,972	\$3,366	\$2,541	\$6,250	\$7,242	\$1,418	\$2,540	\$5,521	\$259,078
Hake, red	\$136	\$281	\$8,381	\$9,219	\$13,095	\$2,760		\$7		\$100		\$33,979
Hake, silver	\$76,105	\$59,863	\$79,984	\$70,214	\$79,194	\$75,955	\$96,832	\$112,782	\$41,198	\$107,622	\$130,331	\$930,080
Hake, white	\$780	\$85,015	\$269,694	\$135,008	\$285,078	\$251,888	\$159,708	\$159,680	\$131,000	\$439,574	\$327,459	\$2,244,884
Halibut, Atlantic	\$1,154	\$1,789	\$2,484	\$1,331	\$674	\$2,969	\$2,846	\$6,112	\$3,361	\$4,532	\$14,867	\$42,119
Herring, Atlantic	\$17,680	\$25,512	\$50,681	\$87,085	\$44,448	\$34,506	\$3,050	\$14,237	\$23,754	\$148,278	\$306,139	\$755,370
Lobster, American	\$4,048,800	\$4,934,205	\$5,033,198	\$5,567,109	\$5,566,282	\$6,655,660	\$6,563,641	\$5,545,775	\$4,702,353	\$5,916,818	\$4,933,439	\$59,467,280
Lumpfish						\$5	\$116	\$781	\$2			\$904
Mackerel, Atlantic	\$14,638	\$5,550	\$25,582	\$20,225	\$21,117	\$13,360	\$7,982	\$4,982	\$7,906	\$8,611	\$4,039	\$133,992
Mantis shrimps										\$826		\$826

Table G1-4: Revenue from Commercial Landings in New Hampshire, 1990-2000 (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Menhaden, Atlantic	\$5,880	\$8,160	\$1,495	\$557					\$5			\$16,097
Mussel, blue								\$12				\$12
Plaice, American	\$207,794	\$168,885	\$314,514	\$350,782	\$385,216	\$350,783	\$352,272	\$301,619	\$287,411	\$200,705	\$177,285	\$3,097,266
Pollock	\$870,009	\$616,293	\$743,414	\$837,745	\$803,698	\$725,822	\$578,714	\$780,992	\$969,587	\$1,429,949	\$1,045,078	\$9,401,301
Pout, ocean	\$912	\$870	\$2,083	\$955	\$343	\$303	\$433	\$354	\$77	\$24	\$28	\$6,382
Redfish or ocean perch	\$19,097	\$23,444	\$6,750	\$9,606	\$11,685	\$11,835	\$7,376	\$6,848	\$9,502	\$20,416	\$18,892	\$145,451
Sandworms								\$2,138				\$2,138
Scallop, sea					\$772	\$1,386	\$1,271	\$8,077	\$50,824			\$62,330
Scups or porgies				\$71								\$71
Sea raven						\$1,285		\$749		\$11	\$7	\$2,052
Sea urchins	\$22,876	\$33,457	\$49,589	\$26,501	\$6,648	\$3,359	\$11,604	\$16,870		\$4,852	\$1,109	\$176,865
Shad, American	\$6,665	\$4,535	\$2,429	\$1,764	\$8,850	\$7,789	\$9,039	\$4,794	\$3,605	\$530	\$642	\$50,642
Shark, porbeagle	\$709	\$90	\$203						\$4,851	\$1,812	\$1,873	\$9,538
Shark, spiny dogfish	\$21,916		\$50,638	\$252,983	\$393,548	\$397,812	\$189,537	\$145,723	\$350,488	\$205,577	\$604,980	\$2,613,202
Sharks	\$2,273	\$6,920	\$3,773	\$4,781	\$8,531	\$7,937	\$5,279	\$3,099	\$470	\$566	\$127	\$43,756
Sheepshead											\$19	\$19
Shellfish										\$453,741	\$482,436	\$936,177
Shrimp, marine other	\$760,886	\$449,781	\$252,492	\$932,247	\$818,524	\$1,420,581	\$1,274,983	\$1,079,186	\$790,976	\$281,570	\$374,583	\$8,435,809
Silversides				\$4,616								\$4,616
Skates	\$1,993	\$2,682	\$2,027	\$2,491	\$20,706	\$11,833	\$12,054	\$8,500	\$8,009	\$9,670	\$12,987	\$92,952
Smelt, rainbow			\$43				\$395					\$438
Snails (conchs)						\$1,635	\$1,707	\$6,363	\$4,192	\$630	\$139	\$14,666
Squid, longfin							\$11					\$11
Squid, northern shortfin	\$49	\$62	\$140		\$5	\$2	\$76	\$252	\$2,850	\$1,611	\$302	\$5,349
Squids	\$211	\$1,735	\$1,298	\$1,507	\$1,084	\$333	\$941	\$189	\$58			\$7,356
Sturgeons	\$117											\$117
Tautog	\$3	\$36	\$2									\$41
Tilefish			\$292	\$29	\$69					\$32		\$422
Tuna, bluefin	\$539,490	\$2,232,641	\$1,208,612	\$1,299,083	\$1,231,522	\$1,197,550	\$849,403	\$1,012,606	\$856,249	\$498,147	\$70,562	\$10,995,865
Tuna, yellowfin						\$1,183						\$1,183
Wolffish, Atlantic	\$9,075	\$7,309	\$8,851	\$6,559	\$9,439	\$14,885	\$11,732	\$12,041	\$11,684	\$6,186	\$7,973	\$105,734
Total	\$10,076,877	\$13,290,154	\$12,054,527	\$12,941,155	\$13,397,832	\$14,925,401	\$13,531,968	\$12,576,587	\$11,186,324	\$12,541,730	\$13,950,594	\$140,473,149

^a Note: "All annual and monthly landing summaries will return only nonconfidential landing statistics. Federal statutes prohibit public disclosure of landings (or other information) that would allow identification of the data contributors and possibly put them at a competitive disadvantage. Most summarized landings are nonconfidential, but whenever confidential landings occur they have been combined with other landings and usually reported as "finfishes, unc" (unclassified) or "shellfishes, unc." Total landings by state include confidential data and will be accurate, but landings reported by individual species may, in some instances, be misleading due to data confidentiality (Personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002)."

Table G1-5: Commercial Fishery Landings in Massachusetts, 1990-2000 (pounds)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Alewife	20,700	20,300	18,700	18,900				180				78,780
Amberjack				22	18	49	1	1		48		139
Argentines										10		10
Bass, striped	159,729	235,238	237,059	266,573	200,000	751,477	695,935	784,892	810,112	766,237	796,159	5,703,411
Bluefish	1,204,033	756,157	829,586	636,205	1,197,661	558,003	906,032	435,781	363,885	411,074	282,356	7,580,773
Bonito, Atlantic	3,734	4,285	87,063	17,263	63,547	39,487	13,750	25,642	24,161	29,724	996	309,652
Butterfish	111,501	27,421	13,030	49,127	58,224	48,472	38,162	67,399	50,630	162,770	75,552	702,288
Catfishes and bullheads					9							9
Clam, arctic surf (Stimpson)	303,240											303,240
Clam, Atlantic jackknife	21,280	24,480	79,968	326,128					35			451,891
Clam, Atlantic surf	1,723,061	2,606,514	2,109,918	2,312,560	6,823,403	6,438,392	2,300,262	1,544,790	1,670,346	880,209	734,052	29,143,507
Clam, ocean quahog				4,847,629	158,206	16,717,424	17,512,360	20,437,600	19,188,980	16,530,140	12,397,360	107,789,699
Clam, quahog	1,100,341	1,001,077	1,006,675	1,098,420								4,206,513
Clam, softshell	967,629	1,148,745	1,419,644	1,348,920								4,884,938
Clams or bivalves	72,912	840,591	49,904		102				4,955			968,464
Cod, Atlantic	72,199,655	62,453,071	42,273,472	36,508,334	27,029,568	21,294,025	23,221,482	22,189,499	20,018,151	18,679,722	19,804,122	365,671,101
Crab, Atlantic rock							265	937		105,792		106,994
Crab, cancer							387			48		435
Crab, deepsea red								2,427,926			5,252,739	7,680,665
Crab, green	800	700	1,000									2,500
Crab, horseshoe		2,040			153	211	275	133	159	14,430		17,401
Crab, jonah					1,327,393	1,077,922	1,204,690	2,696,951	1,118,194	1,739,112	1,358,571	10,522,833
Crabs	4,598,886	4,910,837	3,822,373	4,479,872		110,528	3,026	2,340	1,347,403	3,603,096	3,864,464	26,742,825
Cunner		15	66	573	479	809	395	664	1,160	434	739	5,334
Cusk	1,615,095	1,972,011	1,569,185	1,081,184	770,503	771,600	461,832	301,435	268,149	178,328	140,407	9,129,729
Dolphin	3,688	3,475	4,255	797	1,023	4,398	3,959	8,056	3,808	705	4,619	38,783
Dory, American john					101	1,825	460	4	1,153	1,244		4,787
Eel, American	27,791	23,475	35,798	27,693		30	19	304		363		115,473
Eel, conger	747	43	350	2,216	151	872	571	208	1,060	2,611	1,168	9,997
Escolar											976	976
Finfishes, groundfishes, other	391										2	393
Finfishes, pelagic, other										34	84	118

Table G1-5: Commercial Fishery Landings in Massachusetts, 1990-2000 (pounds) (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Finfishes unc bait and animal food ^a	31,631	4,938	112,574	49,993	9,833	8,080			28,100			245,149
Finfishes unc for food ^a	209,142	208,339	120,362	50,249	431,341	131,618	39,551	11,869	8,344	6,591	6,265	1,223,671
Finfishes unc general ^a	1,569,000							2,745,943			20,006	4,334,949
Finfishes unc spawn ^a		95						9				104
Flatfish	111,905	150,650	167,102	112,377	31,096	20,207	15,255	12,837	1,803	1,572	7,980	632,784
Flounder, summer	628,988	1,121,811	1,383,283	954,463	1,031,203	1,128,120	800,729	745,171	709,387	812,540	788,998	10,104,693
Flounder, windowpane	3,659,143	7,676,566	4,275,610	3,194,349	923,574	1,588,687	2,017,768	980,892	941,919	109,406	300,339	25,668,253
Flounder, winter	11,129,732	12,406,600	9,982,728	8,657,466	5,694,288	6,291,720	8,281,798	9,309,941	8,597,510	7,430,610	8,991,331	96,773,724
Flounder, witch	1,548,640	1,728,640	2,120,628	2,484,740	2,411,680	2,454,202	2,092,391	1,673,440	1,976,581	2,322,016	2,901,059	23,714,017
Flounder, yellowtail	25,579,045	13,104,026	10,527,616	7,000,662	6,305,520	3,878,007	4,407,382	4,551,397	6,596,358	7,373,272	12,433,647	101,756,932
Goosefish	16,978,441	15,592,744	20,952,392	26,482,563	27,273,925	31,744,000	27,137,617	27,064,088	27,618,917	26,446,684	20,887,818	268,179,189
Grenadiers								10				10
Groupers						415				18		433
Haddock	4,890,381	3,453,535	4,376,156	1,582,906	566,848	727,534	997,606	2,236,415	4,258,730	4,948,032	6,871,363	34,909,506
Hagfishes				869,386	2,372,037	3,133,716	3,415,107		1,261,403	2,344,004	5,602,082	18,997,735
Hake, Atlantic red/white					650	8		57				715
Hake, offshore silver						78				11,589		11,667
Hake, red	1,593,565	1,573,577	1,806,616	1,512,702	1,407,159	334,964	861,155	689,398	348,853	406,427	395,904	10,930,320
Hake, silver	8,780,783	8,725,814	7,939,837	5,456,579	4,699,870	2,829,976	2,734,106	2,850,162	2,797,494	4,274,165	4,934,030	56,022,816
Hake, white	4,649,732	4,678,307	5,557,614	4,556,670	3,052,208	3,364,624	2,488,795	1,372,405	1,953,474	2,077,960	1,997,572	35,749,361
Halibut, Atlantic	12,292	21,786	10,347	10,446	7,821	10,786	9,815	5,595	8,736	10,474	6,516	114,614
Halibut, Greenland										2		2
Herring, Atlantic	61,917,269	47,852,491	50,650,281	24,719,975	16,106,401	31,388,855	48,239,980	53,404,269	74,672,252	23,756,110	9,614,704	442,322,587
King, whiting			150		110	2	1,214	58	115	130		1,779
Leatherjackets				12	85	502	1,934	1,890	1,619	406	407	6,855
Lobster, American	17,054,434	16,528,168	15,823,077	14,336,032	16,100,264	15,771,981	15,330,377	15,092,014	13,278,726	15,533,953	14,613,665	169,462,691
Lumpfish						70	200			58		328
Mackerel, Atlantic	1,417,190	307,803	972,757	434,458	757,444	616,681	899,069	1,236,166	2,333,402	1,330,581	479,268	10,784,819
Mackerel, king and cero	21	1,214	234		81	198	4	685	77	254		2,768
Mackerel, Spanish	6,585	19,698	608	5	3,273			15	71	2,407		32,662
Menhaden, Atlantic	1,361,900	6,326,300	6,606,593	1,332,000		61,000	8,500			904,200		16,600,493

Table G1-5: Commercial Fishery Landings in Massachusetts, 1990-2000 (pounds) (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Mussel, blue	5,479,765		5,509,501	1,722,705								12,711,971
Octopus							8					8
Opah						640				88		728
Oyster, eastern	31,388	33,085	48,580	42,185					3			155,241
Perch, white	27,468	7,312	5,845	3,206	161	129	1,699	311	665	620		47,416
Periwinkles									52	2		54
Plaice, American	2,184,670	4,308,396	6,737,235	5,838,508	4,628,509	4,884,640	4,586,529	4,191,964	4,204,038	3,376,840	3,625,243	48,566,572
Pollock	13,611,536	9,144,556	7,060,004	5,595,699	4,174,315	3,631,827	3,079,141	4,681,561	6,166,881	4,838,741	3,593,979	65,578,240
Pout, ocean		1,634,114	392,221	198,304	116,592	82,708	17,498	10,589	7,898	9,513	10,482	2,479,919
Redfish or ocean perch	698,247	618,890	945,093	742,092	598,780	657,981	479,518	290,387	345,604	327,306	292,706	5,996,604
Scallop, bay	254,389	190,847	564,821	136,026		24	1,339					1,147,446
Scallop, sea	22,734,370	22,015,091	19,398,149	8,913,285	6,537,408	7,706,117	8,555,955	7,093,022	5,750,901	12,270,619	16,174,736	137,149,653
Sculpins		4,810		265		880	5	150				6,110
Scups or porgies	1,533,459	1,219,134	1,444,682	1,224,625	780,550	683,943	961,997	1,491,570	959,519	661,581	355,403	11,316,463
Sea bass, black	435,928	244,169	43,123	39,459	20,800	41,525	39,646	91,005	280,696	573,545	625,902	2,435,798
Sea cucumber						135						135
Sea raven		2,663	1,364	10	82	3			175	627		4,924
Sea urchins		320	2,869	733,682	562,594	172,407	102,772	334,456	407,904	283,468		2,600,472
Searobins		12,000	130	74	30	167	32	2	950	11		13,396
Shad, American	5,600	638	308	419	286	441	134	570	1,015	223	268	9,902
Shad, American buck	5			4								9
Shad, American roe						13		182	750			945
Shark, bigeye thresher								158				158
Shark, bignose								13				13
Shark, blue	136					246						382
Shark, dogfish	17,806,480	14,488,910	18,375,718	26,830,777	101,115	845,963		806	1,148		311	78,451,228
Shark, longfin mako	129	4,736	19,998				2,548		924	92		28,427
Shark, makos	283											283
Shark, night						229		55				284
Shark, nurse			4									4
Shark, porbeagle	22,867	13,972	3,179	2,537	1,592	5,738	3,472	3,053	5,816	2,356		64,582
Shark, sand tiger			560									560
Shark, shortfin mako	33,567	57,586	69,924	97,105	87,047	119,377	53,886	51,041	40,208	22,582	22,675	654,998

Table G1-5: Commercial Fishery Landings in Massachusetts, 1990-2000 (pounds) (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Shark, smooth dogfish	275,000	4,400	9,700		12,795	45	6	11,245				313,191
Shark, spiny dogfish					23,113,049	27,914,222	26,959,238	21,819,727	25,033,929	14,929,804	5,761,654	145,531,623
Shark, thresher	1,542			1,090	1,529	791	1,263	421	719	107		7,462
Shark, tiger								14				14
Sharks	75,294	24,507	30,645	25,793	17,798	22,896	19,693	47,252	18,747	8,885	45,507	337,017
Sheepshead										90		90
Shellfish	1,424,444	6,265,148	1,506,909	741,005	636,657	114,434	105,620				342,817	11,137,034
Shrimp, brown			3			365	6,717					7,085
Shrimp, marine, other	2,189,979	1,626,263	643,027	662,113	842,014	1,494,147	1,294,914	709,278	491,760	111,876	243,323	10,308,694
Silversides										3		3
Skates	12,658,620	12,557,364	13,058,290	13,488,726	14,685,991	6,458,124	19,899,001	8,684,294	14,177,490	10,619,501	14,368,941	140,656,342
Smelt, rainbow	1,000	13,200	1,200	1,200								16,600
Snails (conchs)					70,258	213,450	184,931	156,774	197,739	181,328	192,183	1,196,663
Spot				30					60			90
Squid, longfin	1,414,992	1,959,821	681,688	1,390,484	934,101	1,420,698	1,135,166	1,326,198	1,397,935	2,691,001	2,661,560	17,013,644
Squid, northern shortfin	83	200	1,855	1,886	724	137		1,156	1,965,665	1,007,436	15,245	2,994,387
Squids	57,409	23,837	8,327	42,325	36,883	30,960	113,039	343,225	39,572	107,433	14,080	817,090
Sturgeons	562	1,063	114	481	60	444						2,724
Swordfish	2,655,634	1,811,161	1,872,042	1,601,422	1,412,178	1,749,998	1,143,634	1,078,951	1,264,329	1,174,772	1,376,146	17,140,267
Tautog	289,074	354,346	292,291	160,336	37,399	35,298	32,579	64,275	91,424	75,685	96,001	1,528,708
Tilefish	15,531	2,436	6,206	31,844	5,982	1,926	516	821	8,204	3,924	160	77,550
Toadfishes											100	100
Tuna, albacore	39,470	12,860	14,203	7,214	31,920	30,507	21,337	23,054	5,366	6,309	10,741	202,981
Tuna, bigeye	71,058	178,935	129,134	196,868	122,366	288,048	187,354	183,847	120,671	77,528	122,331	1,678,140
Tuna, bluefin	1,753,140	1,335,841	1,352,007	1,395,955	1,352,480	1,270,756	1,485,666	1,747,076	1,660,103	1,872,165	2,094,389	17,319,578
Tuna, little tunny		7,500	5,006	2,419				2,353	4,869	6,536	1,274	29,957
Tuna, skipjack	198	1,484,540	308,644	56		148						1,793,586
Tuna, yellowfin	189,455	2,173,357	1,145,050	21,365	22,261	56,786	69,951	58,290	24,959	20,520	25,596	3,807,590
Tunas	13,307	420	705	56	1,045	1,539	3,223	6,317	4,648	1,398	1,905	34,563
Wahoo		103	1,102			75	47		51	16		1,394
Weakfish	1,720	1,912	3,033	1,080		535	86	55	410	2,550	527	11,908
Wolffish, Atlantic	589,073	698,546	649,859	710,304	711,928	754,099	584,870	500,334	488,376	400,747	294,985	6,383,121
Total	335,841,904	302,052,566	279,288,959	229,425,468	188,476,531	213,997,116	237,279,246	229,915,320	257,438,385	198,877,420	187,938,490	2,660,531,405

^a Note: "All annual and monthly landing summaries will return only nonconfidential landing statistics. Federal statutes prohibit public disclosure of landings (or other information) that would allow identification of the data contributors and possibly put them at a competitive disadvantage. Most summarized landings are nonconfidential, but whenever confidential landings occur they have been combined with other landings and usually reported as "finfishes, unc" (unclassified) or "shellfishes, unc." Total landings by state include confidential data and will be accurate, but landings reported by individual species may, in some instances, be misleading due to data confidentiality (Personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002)."

Table G1-6: Revenue from Commercial Landings in Massachusetts, 1990-2000

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Alewife	\$1,976	\$2,496	\$2,244	\$2,268				\$360				\$9,344
Amberjack				\$4	\$6	\$40	\$1	\$1		\$15		\$67
Argentines										\$28		\$28
Bass, striped	\$310,460	\$482,024	\$335,480	\$516,309	\$302,000	\$676,428	\$960,750	\$1,154,243	\$1,223,245	\$1,196,851	\$2,289,730	\$9,447,520
Bluefish	\$251,555	\$120,570	\$139,270	\$259,629	\$221,219	\$146,545	\$228,577	\$96,321	\$157,948	\$171,015	\$104,692	\$1,897,341
Bonito, Atlantic	\$2,061	\$2,432	\$11,336	\$13,277	\$46,470	\$29,098	\$9,194	\$19,274	\$21,282	\$36,338	\$2,042	\$192,804
Butterfish	\$61,326	\$11,716	\$6,016	\$21,674	\$21,852	\$20,527	\$10,251	\$29,334	\$22,193	\$80,695	\$38,388	\$323,972
Catfishes and bullheads					\$3							\$3
Clam, arctic surf (Stimpson)	\$271,350											\$271,350
Clam, Atlantic jackknife	\$78,900	\$84,125	\$208,755	\$240,365					\$28			\$612,173
Clam, Atlantic surf	\$1,089,042	\$1,362,156	\$1,187,246	\$1,813,213	\$6,106,751	\$5,511,794	\$2,025,273	\$1,312,263	\$1,188,055	\$653,357	\$581,102	\$22,830,252
Clam, ocean quahog				\$3,069,232	\$57,583	\$6,827,627	\$7,316,842	\$8,589,407	\$8,048,112	\$6,904,870	\$5,234,810	\$46,048,483
Clam, quahog	\$5,457,003	\$4,122,098	\$4,416,757	\$4,098,964								\$18,094,822
Clam, softshell	\$4,538,252	\$5,575,514	\$7,398,251	\$7,748,123								\$25,260,140
Clams or bivalves	\$58,043	\$684,550	\$38,564		\$20				\$2,481			\$783,658
Cod, Atlantic	\$46,295,857	\$50,649,672	\$35,996,894	\$32,516,426	\$25,279,616	\$20,303,945	\$19,880,183	\$19,111,274	\$20,819,477	\$20,871,132	\$20,651,479	\$312,375,955
Crab, Atlantic rock							\$135	\$357		\$49,221		\$49,713
Crab, cancer							\$193			\$24		\$217
Crab, deepsea red								\$1,114,117			\$3,636,698	\$4,750,815
Crab, green	\$240	\$210	\$700									\$1,150
Crab, horseshoe		\$204			\$377	\$75	\$119	\$83	\$156	\$7,929		\$8,943
Crab, jonah					\$569,133	\$667,133	\$663,236	\$1,318,895	\$557,411	\$902,110	\$736,339	\$5,414,257
Crabs	\$2,375,745	\$2,348,025	\$1,727,675	\$2,052,841		\$134,935	\$1,503	\$2,546	\$544,790	\$1,639,076	\$2,082,330	\$12,909,466
Cunner		\$6	\$12	\$141	\$193	\$241	\$111	\$236	\$304	\$161	\$216	\$1,621
Cusk	\$720,304	\$958,183	\$762,352	\$533,387	\$434,208	\$449,920	\$274,105	\$175,084	\$186,894	\$138,682	\$87,446	\$4,720,565
Dolphin	\$4,230	\$3,086	\$4,909	\$1,693	\$1,539	\$4,349	\$6,427	\$6,627	\$5,508	\$1,743	\$8,501	\$48,612
Dory, American john					\$113	\$822	\$193	\$3	\$296	\$739		\$2,166
Eel, American	\$35,666	\$28,702	\$54,245	\$33,632		\$14	\$13	\$380		\$182		\$152,834
Eel, conger	\$1,367	\$16	\$68	\$2,847	\$31	\$456	\$118	\$93	\$510	\$1,516	\$563	\$7,585
Escolar											\$1,130	\$1,130
Finfishes, groundfishes, other	\$391										\$1	\$392

Table G1-6: Revenue from Commercial Landings in Massachusetts, 1990-2000 (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Finfishes, pelagic, other										\$101	\$223	\$324
Finfishes unc bait and animal food	\$2,583	\$1,381	\$7,202	\$3,358	\$776	\$564			\$2,333			\$18,197
Finfishes unc for food	\$123,477	\$167,516	\$87,380	\$43,431	\$238,329	\$85,564	\$29,260	\$7,251	\$3,870	\$3,237	\$3,903	\$793,218
Finfishes unc general	\$182,876							\$755,209			\$25,131	\$963,216
Finfishes unc spawn		\$46						\$40				\$86
Flatfish	\$112,108	\$132,066	\$154,807	\$106,080	\$33,229	\$24,109	\$17,455	\$14,957	\$2,125	\$1,517	\$8,145	\$606,598
Flounder, summer	\$1,408,670	\$1,727,449	\$2,032,422	\$2,064,498	\$1,907,260	\$2,502,321	\$1,701,550	\$1,533,127	\$1,386,608	\$1,635,506	\$1,443,860	\$19,343,271
Flounder, windowpane	\$1,478,214	\$4,205,901	\$2,818,513	\$2,188,441	\$547,793	\$995,484	\$857,876	\$509,977	\$365,004	\$34,963	\$91,173	\$14,093,339
Flounder, winter	\$13,343,566	\$14,986,080	\$12,101,594	\$12,076,208	\$8,637,768	\$9,404,437	\$11,765,726	\$12,555,518	\$11,696,023	\$9,672,315	\$8,898,326	\$125,137,561
Flounder, witch	\$2,714,961	\$2,580,414	\$2,789,942	\$3,853,068	\$3,862,469	\$4,209,763	\$3,583,477	\$2,868,526	\$3,256,831	\$3,414,595	\$3,821,671	\$36,955,717
Flounder, yellowtail	\$23,039,450	\$13,953,565	\$11,960,089	\$9,161,035	\$7,545,101	\$5,585,430	\$6,541,012	\$7,092,360	\$9,051,857	\$8,496,328	\$12,510,009	\$114,936,236
Goosefish	\$7,585,652	\$9,698,380	\$8,232,544	\$9,800,666	\$14,411,107	\$20,049,943	\$15,863,372	\$15,377,104	\$15,842,804	\$21,871,872	\$24,120,969	\$162,854,413
Grenadiers								\$10				\$10
Groupers						\$440				\$36		\$476
Haddock	\$5,353,690	\$3,837,254	\$4,721,243	\$2,157,251	\$798,583	\$990,612	\$1,178,641	\$2,455,042	\$5,411,740	\$6,517,286	\$8,908,612	\$42,329,954
Hagfishes				\$234,639	\$672,733	\$865,459	\$945,328		\$326,704	\$667,811	\$1,471,539	\$5,184,213
Hake, Atlantic red/white					\$469	\$8		\$22				\$499
Hake, offshore silver						\$40				\$11,422		\$11,462
Hake, red	\$302,813	\$323,401	\$350,571	\$291,786	\$346,453	\$79,502	\$187,634	\$145,136	\$98,683	\$134,134	\$98,183	\$2,358,296
Hake, silver	\$2,260,496	\$2,626,274	\$2,680,547	\$1,804,195	\$1,624,163	\$1,025,444	\$935,348	\$1,141,722	\$1,419,237	\$2,640,780	\$2,173,212	\$20,331,418
Hake, white	\$1,872,620	\$2,002,978	\$2,500,236	\$2,033,211	\$1,646,550	\$2,184,550	\$1,492,871	\$921,584	\$1,459,152	\$1,544,366	\$1,041,993	\$18,700,111
Halibut, Atlantic	\$23,052	\$43,176	\$23,641	\$17,669	\$18,140	\$27,717	\$24,931	\$14,144	\$21,385	\$23,957	\$19,190	\$257,002
Halibut, Greenland										\$1		\$1
Herring, Atlantic	\$2,771,700	\$2,176,670	\$2,367,588	\$1,148,850	\$733,507	\$1,402,941	\$2,233,927	\$2,657,904	\$3,922,494	\$1,260,226	\$604,066	\$21,279,873
King whiting			\$56		\$44	\$2	\$1,168	\$69	\$96	\$111		\$1,546
Leather-jackets				\$6	\$45	\$362	\$1,395	\$904	\$1,313	\$268	\$337	\$4,630
Lobster, American	\$43,824,047	\$46,389,972	\$48,838,763	\$43,106,462	\$58,412,340	\$55,787,476	\$64,536,117	\$61,980,355	\$48,580,999	\$66,770,985	\$67,460,826	\$605,688,342
Lumpfish						\$15	\$126			\$28		\$169

Table G1-6: Revenue from Commercial Landings in Massachusetts, 1990-2000 (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Mackerel, Atlantic	\$222,187	\$92,657	\$144,917	\$112,106	\$247,114	\$180,075	\$176,680	\$518,832	\$722,356	\$338,114	\$183,579	\$2,938,617
Mackerel, king and cero	\$17	\$608	\$118		\$61	\$324	\$6	\$1,100	\$166	\$474		\$2,874
Mackerel, Spanish	\$5,268	\$9,852	\$307	\$4	\$2,558			\$19	\$84	\$3,532		\$21,624
Menhaden, Atlantic	\$57,086	\$271,055	\$263,749	\$53,065		\$2,745	\$1,870			\$36,168		\$685,738
Mussel, blue	\$1,874,055		\$1,859,144	\$1,009,308								\$4,742,507
Octopus							\$14					\$14
Opah						\$1,078				\$154		\$1,232
Oyster, eastern	\$316,252	\$287,930	\$570,302	\$278,306					\$2			\$1,452,792
Perch, white	\$41,978	\$9,748	\$7,710	\$4,343	\$267	\$144	\$2,380	\$454	\$779	\$1,079		\$68,882
Periwinkles									\$31	\$1		\$32
Plaice, American	\$2,207,701	\$3,981,730	\$6,429,615	\$6,629,740	\$5,429,330	\$6,404,579	\$5,881,754	\$5,731,852	\$5,407,460	\$4,223,372	\$3,756,403	\$56,083,536
Pollock	\$6,740,597	\$5,354,688	\$4,616,044	\$3,735,907	\$3,230,555	\$3,145,426	\$2,062,066	\$2,586,517	\$3,998,778	\$3,833,415	\$2,705,310	\$42,009,303
Pout, ocean		\$186,530	\$38,584	\$24,397	\$15,486	\$11,378	\$5,352	\$4,168	\$2,041	\$2,128	\$2,993	\$293,057
Redfish or ocean perch	\$367,693	\$286,192	\$392,914	\$343,002	\$359,127	\$399,605	\$310,026	\$188,501	\$200,246	\$170,930	\$136,736	\$3,154,972
Scallop, bay	\$1,682,509	\$1,362,864	\$4,056,005	\$1,451,532		\$180	\$2,145					\$8,555,235
Scallop, sea	\$90,970,303	\$93,233,723	\$96,371,352	\$54,617,754	\$35,799,795	\$40,748,009	\$49,734,289	\$47,124,160	\$36,037,285	\$70,334,650	\$85,293,917	\$700,265,237
Sculpins		\$541		\$106		\$170	\$2	\$49				\$868
Scups or porgies	\$1,003,511	\$745,008	\$835,251	\$1,041,525	\$707,719	\$959,469	\$1,388,842	\$2,013,431	\$1,699,017	\$773,811	\$447,650	\$11,615,234
Sea bass, black	\$714,494	\$517,239	\$108,575	\$98,976	\$56,460	\$104,467	\$94,190	\$216,288	\$634,279	\$961,186	\$968,989	\$4,475,143
Sea cucumber						\$27						\$27
Sea raven		\$256	\$326	\$3	\$8	\$2			\$26	\$233		\$854
Sea urchins		\$144	\$1,268	\$338,829	\$348,401	\$135,809	\$77,306	\$279,756	\$356,149	\$292,643		\$1,830,305
Searobins		\$26,280	\$36	\$16	\$4	\$33	\$4	\$1	\$114	\$2		\$26,490
Shad, American	\$2,044	\$149	\$92	\$251	\$174	\$106	\$44	\$172	\$252	\$28	\$52	\$3,364
Shad, American buck	\$1			\$1								\$2
Shad, American roe						\$32		\$67	\$117			\$216
Shark, bigeye thresher								\$200				\$200
Shark, bignose								\$9				\$9
Shark, blue	\$204					\$221						\$425
Shark, dogfish	\$1,597,669	\$1,145,153	\$2,186,537	\$3,541,555	\$18,970	\$114,654		\$806	\$1,553		\$202	\$8,607,099
Shark, longfin mako	\$109	\$3,476	\$17,516				\$2,035		\$1,097	\$132		\$24,365
Shark, makos	\$447											\$447

Table G1-6: Revenue from Commercial Landings in Massachusetts, 1990-2000 (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Shark, night						\$115		\$33				\$148
Shark, nurse			\$1									\$1
Shark, porbeagle	\$16,411	\$12,783	\$2,007	\$1,714	\$811	\$3,335	\$2,514	\$2,139	\$5,541	\$2,154		\$49,409
Shark, sand tiger			\$105									\$105
Shark, shortfin mako	\$35,086	\$52,286	\$63,977	\$87,233	\$61,288	\$94,604	\$49,440	\$45,473	\$33,740	\$20,644	\$23,399	\$567,170
Shark, smooth dogfish	\$22,000	\$450	\$1,761		\$4,220	\$99	\$2	\$2,637				\$31,169
Shark, spiny dogfish					\$3,375,624	\$5,299,126	\$4,934,313	\$3,118,850	\$4,297,312	\$2,316,803	\$1,335,411	\$24,677,439
Shark, thresher	\$496			\$775	\$465	\$289	\$557	\$216	\$450	\$5		\$3,253
Shark, tiger								\$95				\$95
Sharks	\$66,663	\$18,456	\$19,473	\$19,387	\$11,246	\$15,568	\$14,296	\$33,360	\$13,621	\$5,031	\$12,519	\$229,620
Sheepshead										\$50		\$50
Shellfish	\$1,027,502	\$2,955,217	\$2,078,790	\$1,293,713	\$302,402	\$70,872	\$68,649				\$455,459	\$8,252,604
Shrimp, brown			\$1			\$1,095	\$18,558					\$19,654
Shrimp, marine, other	\$1,352,270	\$1,343,639	\$554,218	\$575,269	\$571,701	\$1,092,283	\$917,437	\$576,018	\$380,712	\$65,984	\$168,653	\$7,598,184
Silversides										\$4		\$4
Skates	\$1,253,043	\$1,119,667	\$1,611,536	\$2,058,800	\$4,239,421	\$1,422,682	\$4,386,298	\$1,496,587	\$2,494,605	\$1,829,753	\$2,359,267	\$24,271,659
Smelt, rainbow	\$60	\$2,724	\$84	\$84								\$2,952
Snails (conchs)					\$86,903	\$358,700	\$344,902	\$302,393	\$380,212	\$381,402	\$431,736	\$2,286,248
Spot				\$15					\$15			\$30
Squid, longfin	\$562,922	\$1,012,051	\$463,675	\$815,094	\$649,976	\$889,908	\$877,499	\$1,006,012	\$1,292,914	\$2,120,212	\$1,610,534	\$11,300,797
Squid, northern shortfin	\$27	\$36	\$192	\$348	\$535	\$117		\$544	\$558,293	\$308,847	\$6,004	\$874,943
Squids	\$10,024	\$10,149	\$2,707	\$19,094	\$19,680	\$22,918	\$109,119	\$358,390	\$37,903	\$70,776	\$7,450	\$668,210
Sturgeons	\$524	\$645	\$89	\$308	\$12	\$500						\$2,078
Sword-fish	\$7,724,561	\$5,213,806	\$5,106,971	\$4,369,054	\$4,174,420	\$4,621,991	\$3,428,561	\$2,397,245	\$2,389,189	\$2,705,730	\$3,435,687	\$45,567,215
Tautog	\$123,843	\$149,214	\$113,930	\$118,782	\$30,285	\$30,413	\$28,562	\$96,259	\$147,724	\$141,239	\$166,163	\$1,146,414
Tilefish	\$14,543	\$3,256	\$7,017	\$27,182	\$9,367	\$2,769	\$529	\$966	\$13,042	\$8,581	\$286	\$87,538
Toadfishes											\$1	\$1
Tuna, albacore	\$39,178	\$11,706	\$13,717	\$5,195	\$19,036	\$18,188	\$11,777	\$12,086	\$4,108	\$2,844	\$6,937	\$144,772
Tuna, bigeye	\$152,275	\$375,764	\$298,085	\$522,550	\$345,593	\$566,426	\$557,283	\$466,726	\$275,677	\$196,521	\$402,347	\$4,159,247
Tuna, bluefin	\$17,695,590	\$10,383,269	\$9,067,201	\$12,256,397	\$11,576,322	\$13,134,219	\$13,016,964	\$13,172,177	\$8,777,311	\$11,781,784	\$15,986,813	\$136,848,047
Tuna, little tunny		\$9,375	\$3,752	\$6,189				\$318	\$957	\$1,679	\$238	\$22,508
Tuna, skipjack	\$39	\$111,299	\$78,400	\$22		\$324						\$190,084
Tuna, yellowfin	\$208,919	\$432,208	\$219,193	\$43,823	\$39,055	\$96,955	\$135,878	\$117,014	\$48,559	\$43,366	\$68,307	\$1,453,277
Tunas	\$15,156	\$254	\$991	\$34	\$3,973	\$3,759	\$8,966	\$13,624	\$14,283	\$3,271	\$6,762	\$71,073
Wahoo		\$53	\$2,129			\$99	\$47		\$153	\$48		\$2,529
Weakfish	\$1,342	\$1,036	\$1,352	\$524		\$408	\$69	\$7	\$293	\$1,991	\$398	\$7,420

Table G1-6: Revenue from Commercial Landings in Massachusetts, 1990-2000 (cont.)

Species	Year											Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Wolffish, Atlantic	\$207,824	\$245,031	\$213,235	\$226,921	\$266,351	\$277,000	\$226,469	\$189,208	\$233,373	\$165,885	\$129,913	\$2,381,210
Total	\$306,288,166	\$302,268,505	\$291,782,863	\$238,744,112	\$206,482,688	\$220,229,427	\$232,152,132	\$225,036,618	\$206,089,767	\$260,504,185	\$288,266,950	\$2,777,845,413

* Note: "All annual and monthly landing summaries will return only nonconfidential landing statistics. Federal statutes prohibit public disclosure of landings (or other information) that would allow identification of the data contributors and possibly put them at a competitive disadvantage. Most summarized landings are nonconfidential, but whenever confidential landings occur they have been combined with other landings and usually reported as **"finfishes, unc"** (unclassified) or **"shellfishes, unc."** Total landings by state include confidential data and will be accurate, but landings reported by individual species may, in some instances, be misleading due to data confidentiality (Personal communication, National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD, 2002)."

G1-3.3 Recreational Activities

a. Recreational fishing

Striped bass (*Morone saxatilis*), summer flounder (*Paralichthys detatus*), Atlantic cod, scup (*Stenotomus chrysops*), and bluefish had the greatest number of recreational landings in New England between 1990 and 1998. Information from the Marine Recreational Fisheries Statistics Survey (MRFSS) (NMFS, 2001b), a long-term monitoring program that provides estimates of effort, participation, and finfish catch by recreational fishermen, indicates that 644 marine fishing sites are located near the three main New England power plants, which are the Seabrook and Pilgrim facilities and the Brayton Point station in Massachusetts, located on Mount Hope Bay, an upper embayment of Narragansett Bay (Figure G1-2).

EPA used data from both the MRFS intercept and telephone interviews to evaluate fishing activities in the vicinity of the Seabrook, Pilgrim, and Brayton Point facilities. MRFS intercept interviews were conducted at a subset of all NMFS sites. Approximately 70 percent of all sites near each plant were included in the survey. A total of 17,397 intercept surveys were completed at the fishing sites located in the 50-mile radius from the three plants, along with 14,936 telephone surveys.

Table G1-7 presents the number of NMFS sites within 50 miles of each of the three facilities, MRFS intercept sites, and the number of surveys included in this analysis.

Table G1-7: Intercept Interview Statistics for Sites within 50 Miles of the Three Major New England Power Plants

	Brayton Point	Pilgrim	Seabrook	Total ^a
NMF sites	410	415	213	644
Intercept sites	242	293	140	399
Number of intercept interviews	19,524	14,923	8,436	28,260
Number of telephone interviews	14,282	11,150	6,640	21,710

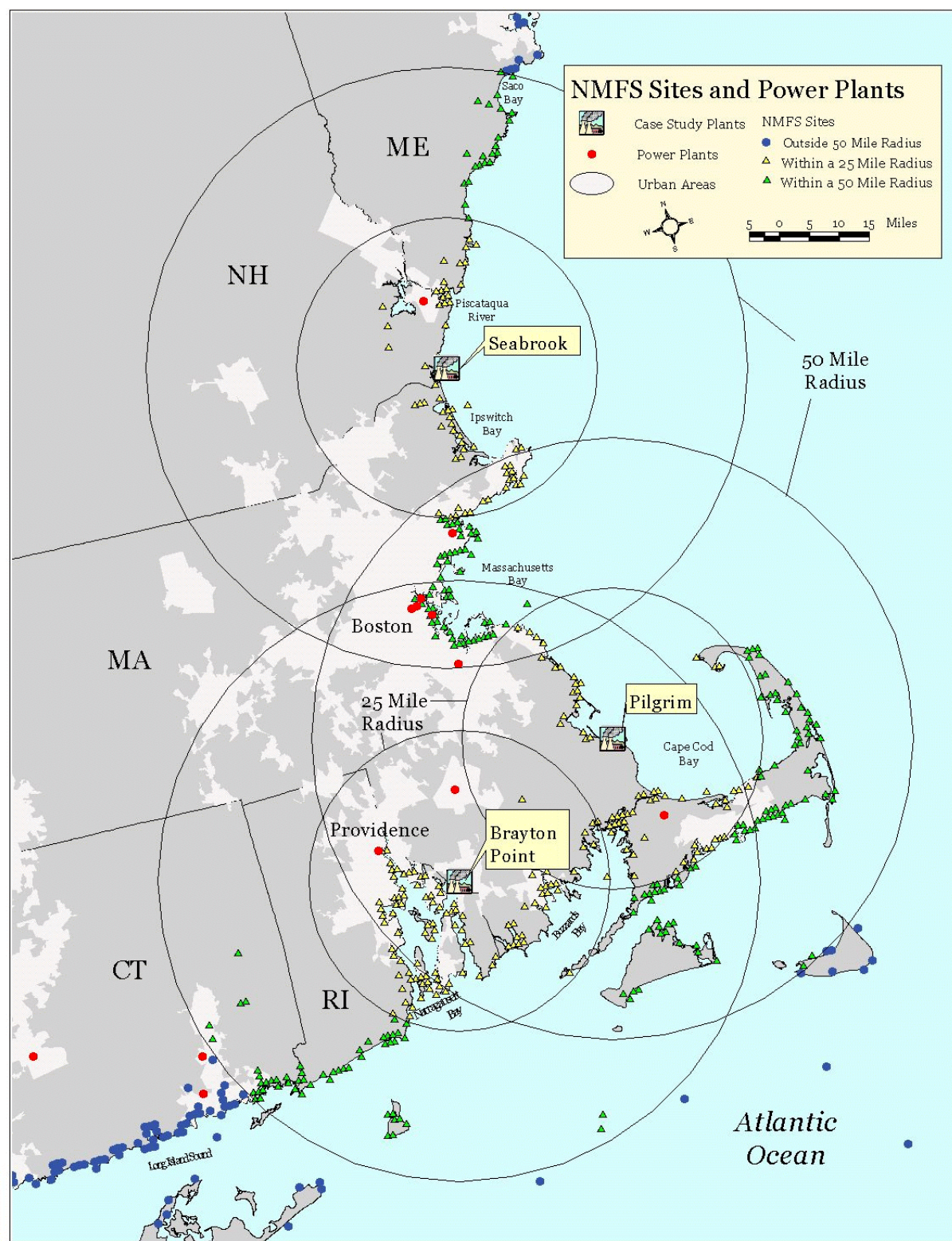
^a The total number of sites is less than the sum from each power plant because some sites are within 50 miles of both the Pilgrim and Brayton Point plants.

Both the Brayton Point and Pilgrim power plants are near highly populated areas, Boston and Providence. Because the majority of recreational fishermen (83 percent) take single day trips and prefer to visit fishing sites closer to their hometown, both the number of fishing sites and the number of fishing trips to these sites are higher near Brayton Point and Pilgrim compared to the Seabrook plant.

MRFS data indicate that roughly 30 percent of fishermen near the New England facilities target small game species, including striped bass, Atlantic mackerel, and blue fish. Roughly 9 percent of recreational fishermen specifically targeted striped bass and an additional 5 percent specifically targeted either bluefish or Atlantic mackerel. Nearly twice as many fishermen target small game than the next most popular species group, bottom fish (e.g., Atlantic cod and scup). Nine percent of recreational fishermen target flounders and other flatfish and three percent target Atlantic cod. Less than 1 percent specifically targets scup.

Between 35 and 40 percent of fishermen do not target any species. Over half of “no target” fishermen fish from the shore and tend to catch “whatever bites.” They often catch small game species because a number of these species have aggressive behavior and are easy to catch from shore. The percentage of fishermen targeting big game species (e.g., shark, swordfish, tarpon) ranges from 10 percent at sites near the Brayton Point plant to less than 5 percent at sites affected by either Seabrook or Pilgrim.

Figure G1-2: NMFS Recreational Fishing Sites and Power Plants



b. Tourism and other recreational activity

The Hampton/Seabrook estuary is the most popular recreational softshell clam harvesting area in New Hampshire (New Hampshire Estuaries Project, 2002). The sandy beaches of the area are a popular tourist destination, and are heavily used. Because of overuse and human development, the dunes in the Hampton/Seabrook estuary have been drastically reduced, and restoration of sand and dunegrass has recently begun (New Hampshire Estuaries Project, 2002).

Nonfishing related boating activity in the area around Seabrook is primarily recreational, and includes sailing, water skiing, wind surfing, rowing, kayaking, and canoeing. Just over 90% of the boats registered for “fresh and tidal water” were in the “private/rental” class (New Hampshire Estuaries Project, 2002).

Many historical sites attract tourists to Massachusetts bays from around the world, including the area near the Pilgrim facility. Plymouth County is one of the leading counties in Massachusetts in terms of tourism revenue.